

in the form of snow and could not be recorded by the self-registering gauge, as rain has been recorded. In most instances the accumulated hourly amounts of precipitation that fell as snow have been credited to the hours ending 7 a. m. and 7 p. m.—the regular observation hours—with the result that the means for those hours are abnormally high for the winter months. To a less extent accumulated amounts have been credited to the hour ending at midnight, which has caused a slight rise in the mean for that hour. This trouble does not appear in the records for the warm months of the year, May to September, inclusive, and is seen to but a small extent in the records for April and October.

p. m. A maximum wind velocity of 52 miles and an extreme velocity of 64 miles per hour from the northwest occurred at 3:57 p. m.

A peculiar feature of this storm can best be described as a large whirlwind cutting a path about 30 feet wide. It was first noticed on the Arkansas side of the river, where part of a large tree was blown down about 3:55 p. m. Moving from a WNW. direction across the river, it carried spray from the surface of the water spirally upward in a counterclockwise direction to the base of the low-lying clouds. The clouds at this point were very turbulent and moving rapidly from the WNW. In its passage across Wolf River, to the east of and parallel to

TABLE 1.—Average hourly precipitation at Topeka, Kans., 1905-1923

[Inches and hundredths]

Month	A. M.												P. M.											
	1	2	3	4	5	6	7	8	9	10	11	Noon	1	2	3	4	5	6	7	8	9	10	11	Mid-night
January.....	0.02	0.01	0.02	0.03	0.02	0.03	0.13	0.02	0.02	0.01	0.02	0.03	0.02	0.01	0.02	0.03	0.02	0.04	0.12	0.08	0.03	0.03	0.04	0.08
February.....	0.04	0.05	0.02	0.06	0.05	0.04	0.11	0.04	0.03	0.07	0.05	0.07	0.08	0.05	0.04	0.03	0.05	0.08	0.28	0.02	0.04	0.04	0.07	0.11
March.....	0.08	0.09	0.06	0.07	0.06	0.04	0.19	0.05	0.03	0.05	0.05	0.06	0.04	0.09	0.10	0.08	0.10	0.09	0.19	0.10	0.09	0.12	0.21	0.25
April.....	0.17	0.11	0.16	0.10	0.09	0.10	0.19	0.12	0.07	0.06	0.06	0.08	0.08	0.05	0.07	0.08	0.12	0.07	0.18	0.09	0.11	0.08	0.12	0.16
May.....	0.15	0.22	0.25	0.16	0.24	0.27	0.22	0.20	0.12	0.13	0.19	0.13	0.11	0.24	0.15	0.14	0.16	0.13	0.18	0.21	0.26	0.24	0.13	0.15
June.....	0.18	0.14	0.28	0.23	0.34	0.21	0.14	0.12	0.12	0.16	0.12	0.13	0.08	0.11	0.10	0.10	0.09	0.21	0.28	0.26	0.28	0.26	0.22	0.14
July.....	0.32	0.30	0.32	0.20	0.16	0.33	0.18	0.09	0.08	0.05	0.05	0.01	0.05	0.10	0.13	0.16	0.18	0.24	0.13	0.08	0.17	0.22	0.21	0.21
August.....	0.16	0.15	0.22	0.24	0.18	0.34	0.24	0.18	0.08	0.08	0.15	0.06	0.06	0.07	0.09	0.04	0.12	0.25	0.17	0.20	0.25	0.18	0.21	0.21
September.....	0.30	0.26	0.21	0.21	0.34	0.27	0.28	0.26	0.22	0.14	0.10	0.12	0.08	0.05	0.23	0.13	0.08	0.15	0.11	0.10	0.16	0.41	0.22	0.18
October.....	0.10	0.11	0.07	0.12	0.19	0.09	0.07	0.10	0.11	0.08	0.07	0.06	0.07	0.10	0.09	0.09	0.08	0.08	0.14	0.11	0.17	0.12	0.10	0.19
November.....	0.10	0.07	0.08	0.10	0.07	0.04	0.10	0.04	0.02	0.07	0.08	0.03	0.06	0.06	0.09	0.06	0.12	0.13	0.13	0.07	0.06	0.08	0.09	0.12
December.....	0.01	0.01	0.03	0.04	0.01	0.02	0.11	0.03	0.04	0.04	0.02	0.03	0.02	0.02	0.03	0.06	0.06	0.05	0.15	0.04	0.03	0.03	0.04	0.08
Entire period.....	0.14	0.13	0.14	0.13	0.15	0.15	0.16	0.10	0.08	0.08	0.08	0.07	0.06	0.08	0.10	0.08	0.10	0.13	0.17	0.11	0.14	0.15	0.14	0.16
April to September, inclusive.....	0.21	0.19	0.24	0.19	0.22	0.25	0.21	0.16	0.12	0.10	0.11	0.09	0.08	0.10	0.13	0.11	0.12	0.18	0.18	0.16	0.20	0.23	0.18	0.18

## THUNDERSTORM AT MEMPHIS, TENN., APRIL 29, 1924

By A. R. LONG, Observer

[Weather Bureau, Memphis, Tenn., May 10, 1924]

The weather map on the morning of April 29 showed an area of low pressure of considerable intensity central over Oklahoma. On the morning of April 30 it was central over the lower Ohio Valley. Numerous thunderstorms occurred on the eastern and southern sides of this low-pressure area.

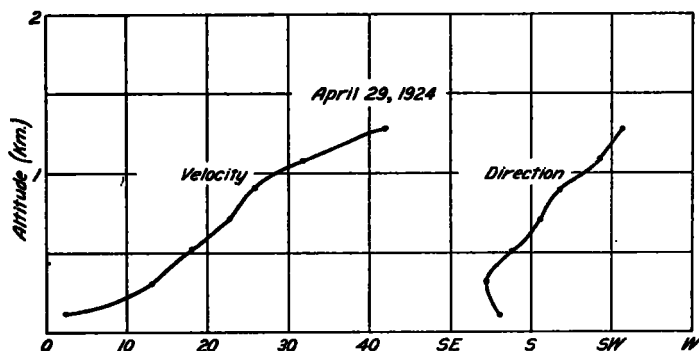


FIG. 1.—Wind velocity and direction just previous to thunderstorm (3:11 p. m.)

A thunderstorm of mild character occurred at Memphis on the morning of April 29. Another thunderstorm occurred during the afternoon, and the following notes are taken from the station records. First thunder heard at 3:20 p. m. and continued at lengthy intervals until 7 p. m. Rain began 3:50 p. m. and ended 7:20 p. m. A trace of hail fell from 4 p. m. until 4:01 p. m. Excessive precipitation began 4 p. m. and ended 4:30

the Mississippi River, it seemed to disturb the houseboats in its path more than the other houseboats on either side. Several windows were broken out of the Fall Building, situated upon the bluff about 500 feet from Wolf River and in the path of this disturbance, while adjoining buildings on both sides escaped undamaged. Branches were broken off of a number of trees and a few windows broken at several other places in the city, but no serious damage was reported.

551.574 (749)

## FROST ON THE CRANBERRY BOGS OF NEW JERSEY

By GEORGE S. BLISS, Meteorologist

[Weather Bureau Office, Philadelphia, Pa., January 26, 1924]

The Weather Bureau has studied frost conditions on the cranberry bogs for many years, partly for the purpose of improving the forecasts and effecting greater savings thereby, and partly because of the interesting meteorological problems that the conditions present.

In 1906 and 1907 Prof. Henry J. Cox, of the Chicago station, made an exhaustive study of these conditions on the Wisconsin bogs, and the results were published as Bulletin T, W. B. No. 443. In 1917 Mr. C. A. Donnel spent the fall season at Whitesbog, N. J., and studied the physical conditions, but did not carry his studies far enough to work out any conclusive results.

In the fall of 1921 the Weather Bureau began a series of temperature and humidity observations at Whitesbog, under the supervision of the writer, for the purpose of obtaining data from which to compute a radiation formula (i. e., an equation from which to compute the minimum to which the radiation will carry the temperature during the night) for use in forecasting bog minimum temperatures. The fall series of observations was made